10/12/07

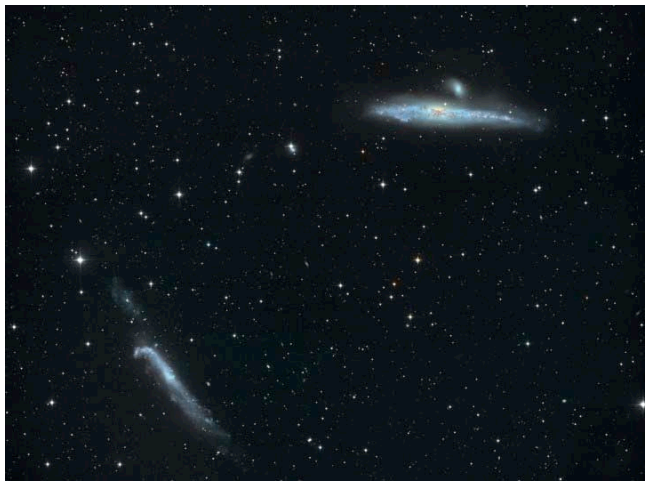
Reading - Chapter 6, 7

Test 2, Friday, October 19, Review sheet next week, review session Thursday, 5 PM room RLM 4.102

Astronomy in the news? First Woman Commander of the International Space Station

Allen Telescope Array, first 42 of planned 350 radio telescopes activated, search for exterrestrial life, astrophysics

Pic of the Day: The Whale Galaxy



Press Coverage of new bright supernova, SN 2005ap

Space.com

http://www.space.com/scienceastronomy/071011-brightest-supernova.html

MSNBC

http://www.msnbc.msn.com/id/21259692/

Sky Watch

Can only count each objects once for credit, but can do any objects missed earlier in later reports.

Add relevant objects that I don't specifically mention in class, other examples of planetary nebulae, main sequence stars, red giants, binary stars, supernovae….

Don't wait until the last minute. It might be cloudy.

The Earth orbits around the Sun, some objects that were visible at night become in the direction of the Sun, "up" in daylight, impossible to see, other objects that were inaccessible become visible at night. Check it out.

Sky Watch Objects mentioned so far

Lyra - Ring Nebula, planetary nebula in Lyra

Sirius - massive blue main sequence star with white dwarf companion

Algol - binary system in Perseus

Vega - massive blue main sequence star in Lyra

Antares - red giant in Scorpius

Betelgeuse - Orion, Red Supergiant due to explode “soon” 15 solar masses

Rigel - Orion, Blue Supergiant due to explode later, 17 solar masses

Aldebaran - Bright Red Supergiant in Taurus, 2.5 solar masses (WD not SN)

CP Pup, classical nova toward constellation Puppis in 1942

Pup 91, classical nova toward Puppis in 1991

QU Vul, classical nova toward constellation Vulpecula,

GK Per toward constellation Perseus, has had both a classical nova eruption 1901 and dwarf nova eruptions.

SN 1006 - Lupus/Centaurus (not this time of year)

SN 1054 Crab Nebula - Taurus

SN 1572 Tycho - Cassiopeia

SN 1604 Kepler - Ophiuchus

Cassiopeia A - Cassiopeia

Vela supernova - Vela (not this time of year)

SN 2005ap - new (very distant) bright supernova, Coma Berenices

Sky Watch Extra Credit

Due Monday, October 22 in Class

Must be typed on 8-1/2x11 paper

See web site for more details, or ask!

See web site for star charts to help guide you where and when to look.

One Minute Exam

What sort of particles are created that trigger the explosion of a pair-formation supernova?

A) Electrons and Protons

B) Protons and Neutrons

C) Electrons and Positrons

D) Positrons and Protons

One Minute Exam

When SN 1987A exploded, where would have been a good place to have seen it with your naked eye?

A) Texas

B) Japan

C) France

D) Argentina

LMC w/arrow

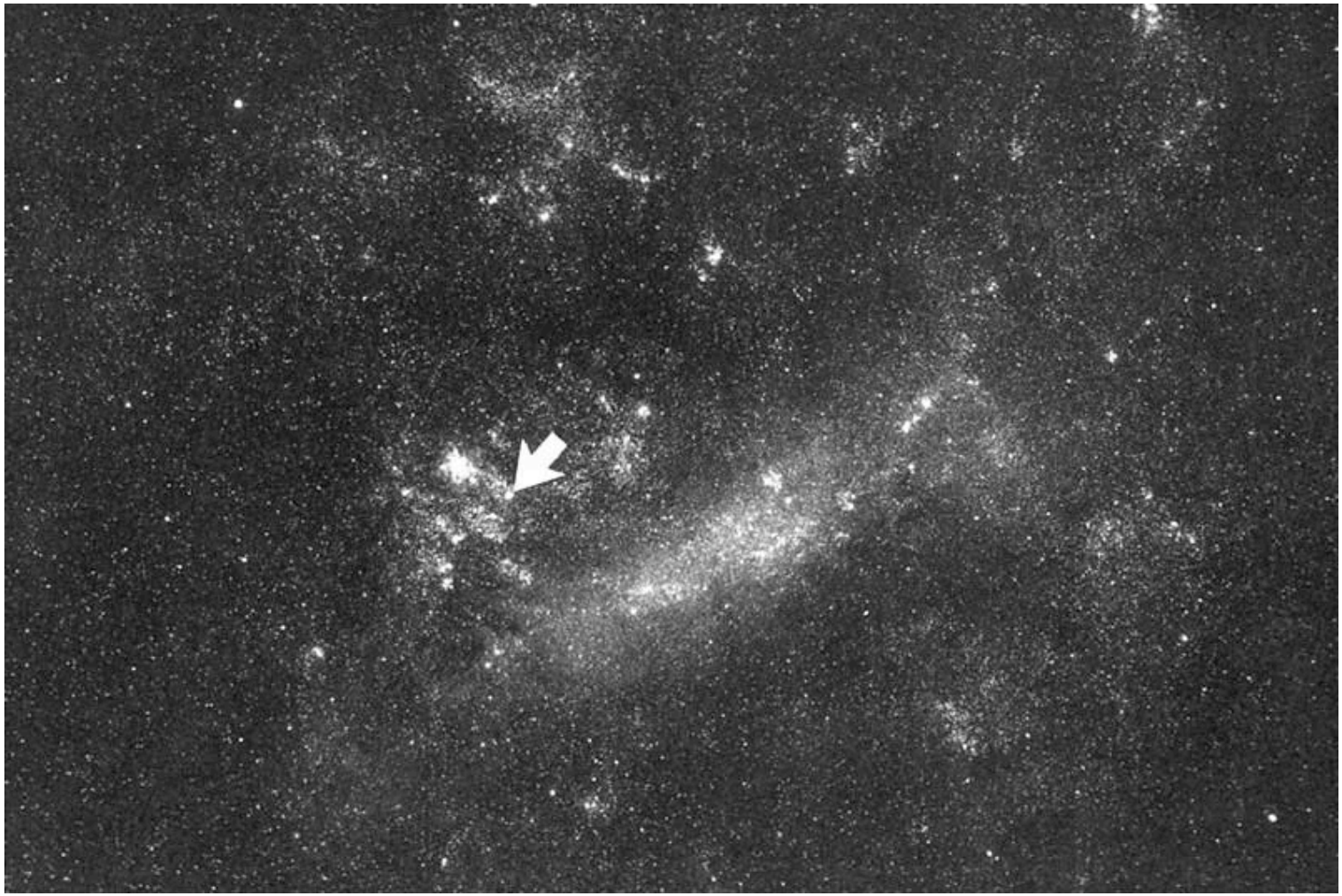
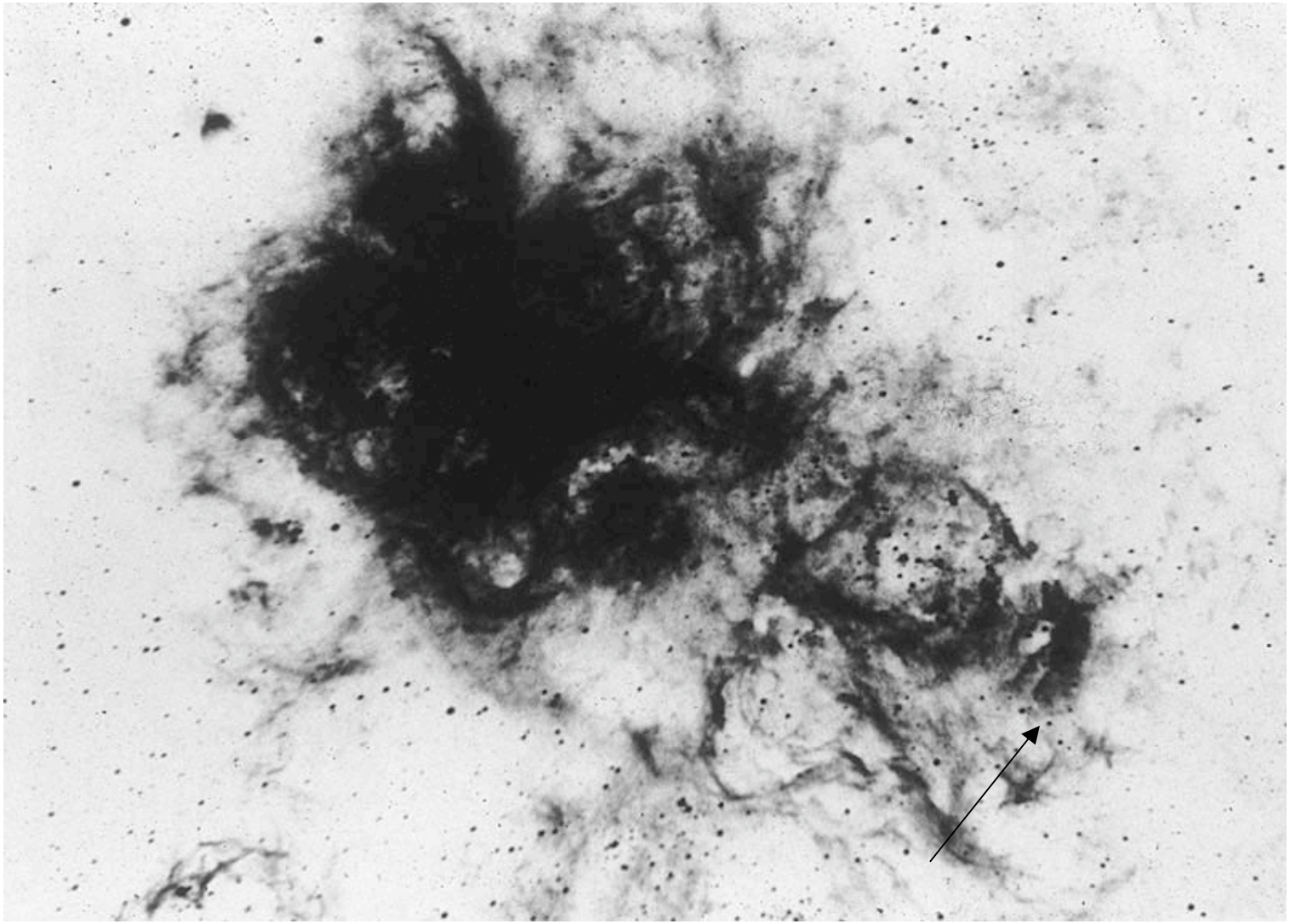
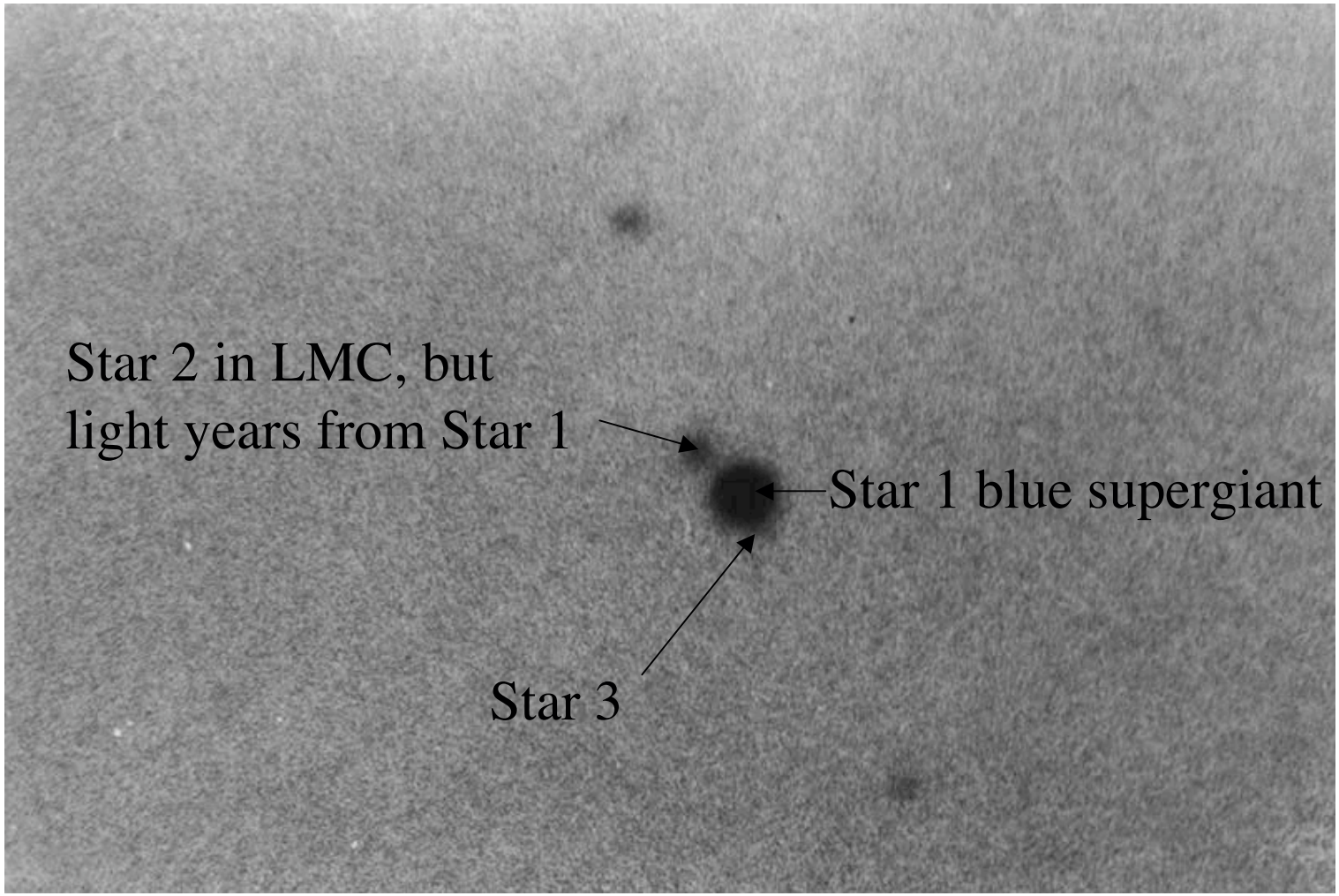


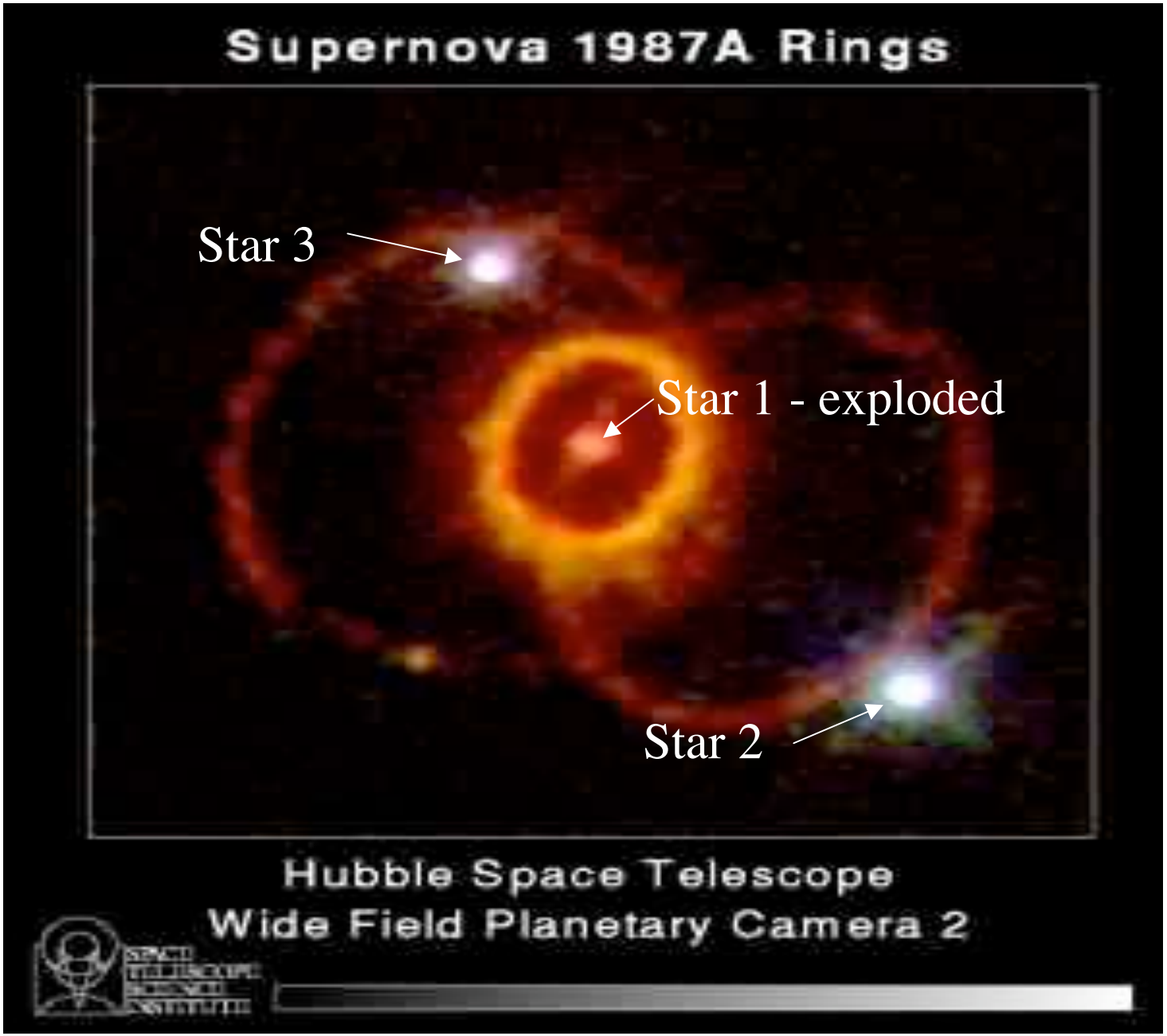
Photo of progenitor star (giraffe)

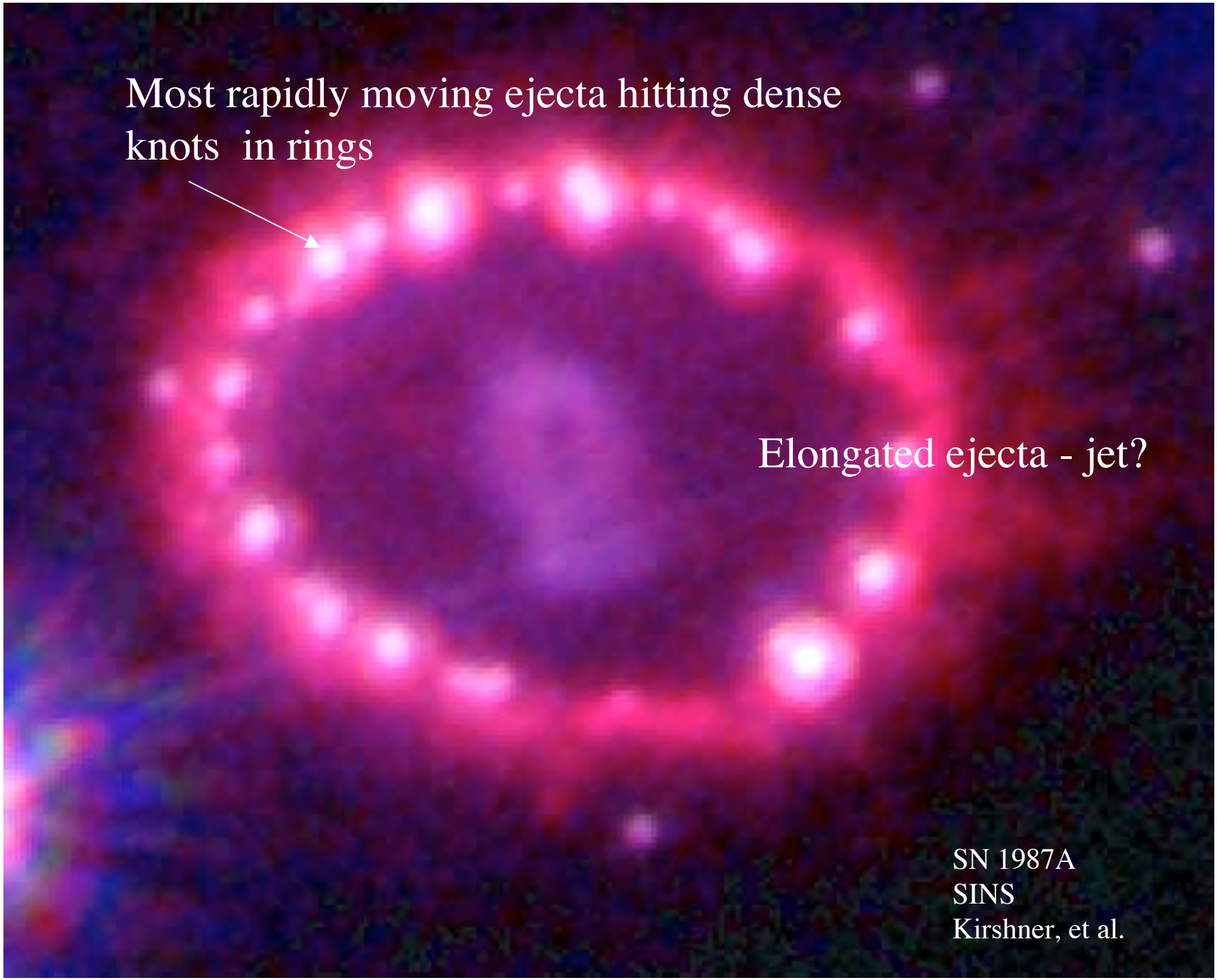


Stars 1, 2, 3



Close-up


Supernova 1987A Rings
Star 3
Star 1 - exploded
Star 2
Hubble Space Telescope
Wide Field Planetary Camera 2


Most rapidly moving ejecta hitting dense knots in rings
Elongated ejecta - jet?
SN 1987A
SINS
Kirshner, et al.

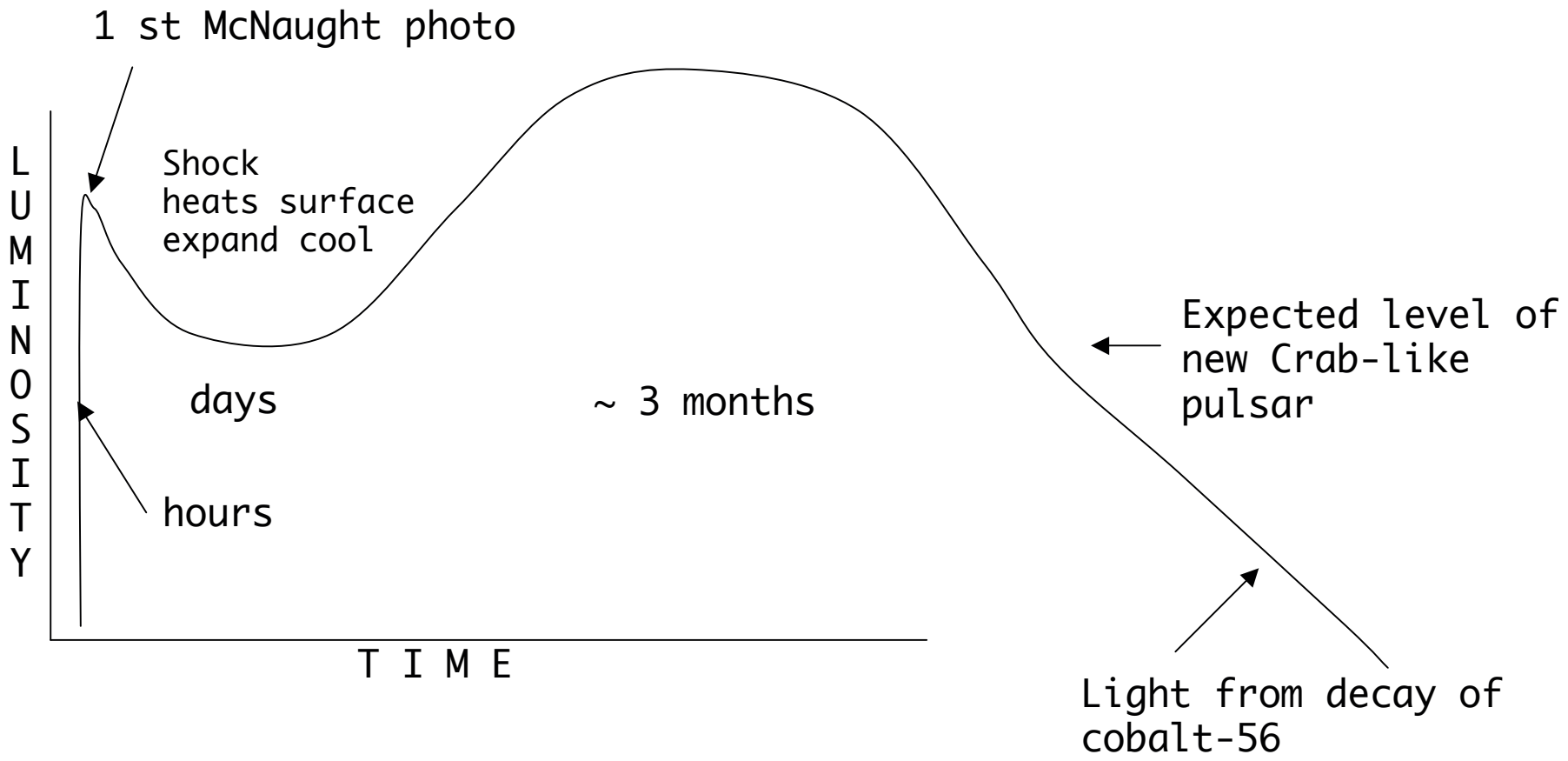
The single most important thing about SN 1987A is that we detected the neutrinos!

It was definitely a core-collapse event

10^{57} neutrinos emitted, most missed the Earth. Of those that hit the Earth, most passed though since neutrinos scarcely interact.

About 19 neutrinos were detected in a 10 second burst.

170,000 year history!

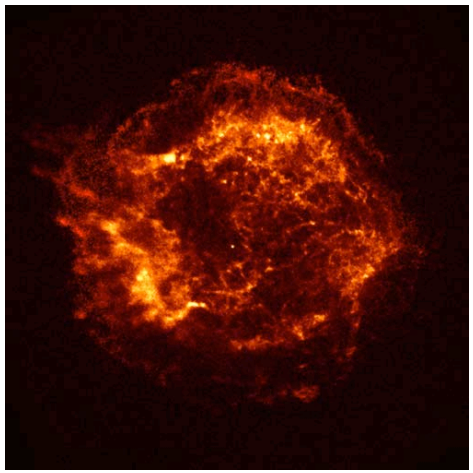


SN 1987A had a rather peculiar light curve because it was a relatively compact blue supergiant, not a red supergiant, brief shock heating, rapid cooling by expansion, no plateau, subsequent light all from radioactive decay

Neutrinos from SN 1987A proved a neutron star formed and lasted for at least 10 seconds while neutrinos were detected - where is it?

Expected to see it in ~ 1 year - still looking almost 20 years later

Any neutron star is dimmer by at least a factor of 10 than 1000 year-old Crab pulsar



If similar to object in Cas A, much too dim to detect

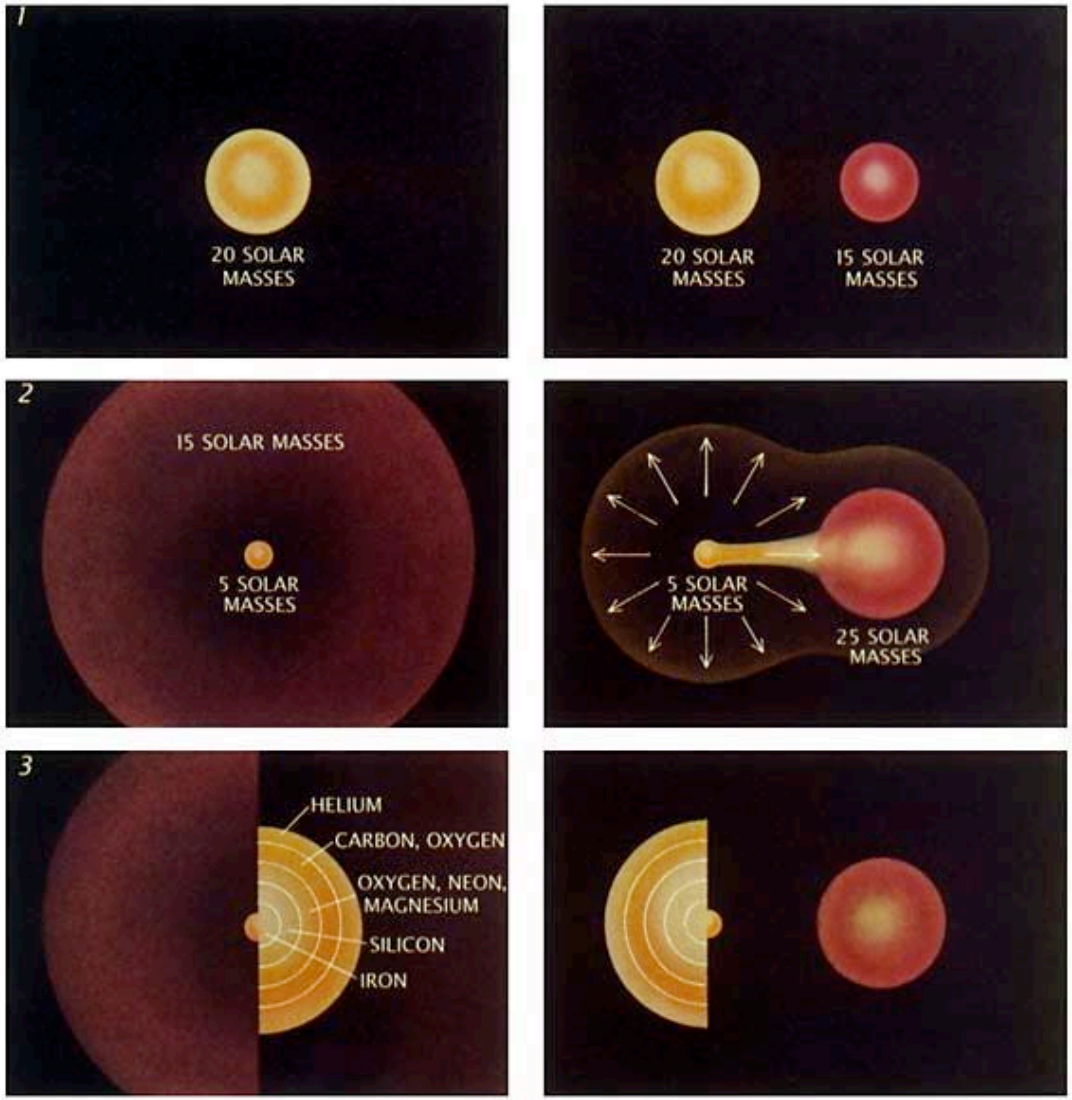
100 to 1000 × dimmer than Crab pulsar

Possibly black hole, not neutron star??
Don't know. Can't rule out.

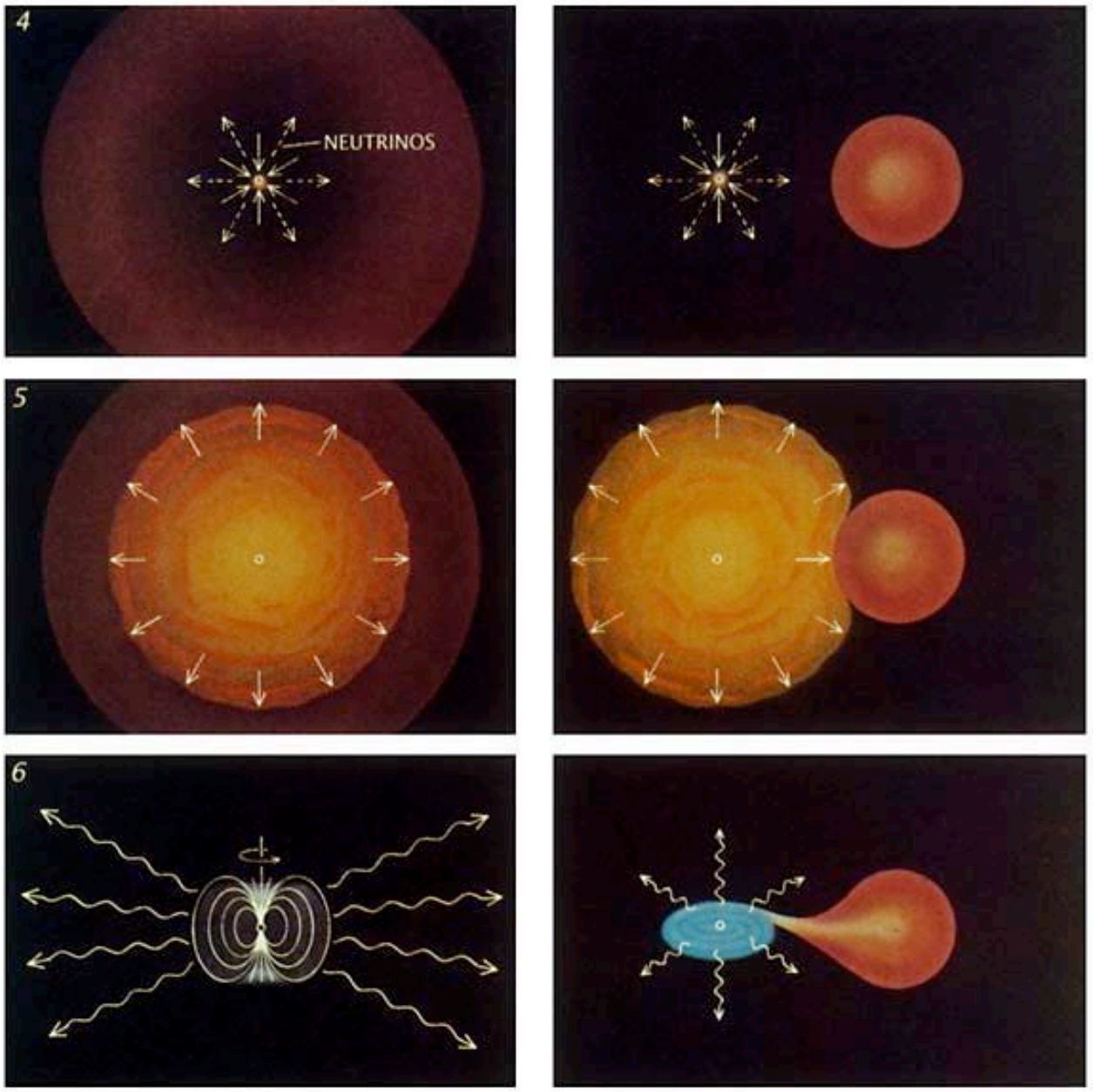
Neutron star could be "hidden," or a slow rotator, or with a weak magnetic field, but counter to notion of jet - some evidence for jet

Single star: Type II

Same star in binary: Type Ib/c



Same evolution inside star, thermal pressure, regulated burning, shells of heavier elements, whether envelope there or not



Rotating, magnetic radio pulsar.

Neutron star in binary system, X-ray source

End of Material for Test 2